CONCEPTUAL FEATURES AND OBSTACLES TO THE IMPLEMENTATION OF A CIRCULAR ECONOMY MODEL

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Abstract

The article concludes that, at this stage of human development, the economy has become a significant factor in the direct influence on the natural environment. This influence has arisen from economic development aimed at meeting human needs while disregarding the need to ensure the environmental neutrality of production and consumption. The article presents the results of a study that identifies promising areas for the development of the circular economy. It considers the circular economy to be a certain stage of economic evolution and an integral component of real anthropogenic and natural resource cycles. Using this approach alongside the conceptual provisions of the circular economy enabled the development of a system for defining economic types, a cyclical-resource model of the anthropogenic environment and a set of theoretical and methodological support for substantiating the development of the circular economy.

Keywords: circular economy, economic development, technology, environment, anthropogenic impact

I. Introduction

At the present stage of human development, the economy is acquiring the significance of a factor of direct impact on the natural environment. This is confirmed by the facts of landscape changes, depletion of mineral deposits, environmental pollution, etc. The most significant climate changes on Earth in the current era of geological history are determined by periods of global warming, but modern global warming is occurring at a somewhat faster pace than in previous periods. A significant part of the expert community claims that the cause of this phenomenon is the negative anthropogenic impact on the environment, caused by the growth of the population and its needs, and, consequently, the scale of the economy.

The solution to this problem today is seen in the construction of a system of production relations that, along with satisfying human needs, would ensure the growth of rational use of natural resources and the reduction of anthropogenic load on the environment. The solution to this problem requires supplementing the industrial model of the economy, objectively formed over centuries of economic evolution, with requirements for rational use of natural resources.

The results of the search for ways to solve this problem are seen today in the implementation of the concepts of sustainable development, circular economy, and “green” economy.

Many works by domestic and foreign scientists are devoted to the consideration of various elements of the circular economy, in particular, it is worth highlighting: T.V. Uskova [1], E.D. Kopytova [1], R.N. Botavina [2], I.A. Yakovlev [3], L.S. Kabir [3], S.N. Bobylev [4], S.V. Solovieva [4]. At the same time, the problems of the circular economy are becoming relevant right now, since it is capable of transforming the production model, promoting economic growth, reducing the volume of waste and providing consumers with innovative products.

II. Methods

The purpose of this study is to substantiate the directions of structural and technological transformations in the national economy aimed at the formation of systemic features in it that meet the conceptual requirements of the circular economy.

The following methods were used in the research: comparative analysis (assessment of public policy measures); abstract logical (problem statement, justification of conclusions); monographic (analysis of scientific works).

Given the objective of the study, the initial position of this article is to systematize the defining features of various types of economies inherent in past stages of economic evolution and the conceptual requirements of the circular economy [1-5], namely, types of natural resource sources, types of economic resource cycles and degrees of anthropogenic impact on the environment, the characteristics of which are summarized in Table 1. The defining features in the aggregate are inherent in the circular economy, as well as those that are present in the models of other economies, are hereinafter referred to as "circular".

Table 1: *Defining features of historical types of economic development*

Type (model) of economy	**Defining features**		
	types of resource sources	**type of economic resource cycle**	**degree of anthropogenic impact**
pre-industrial economy	mostly inexhaustible and renewable	open	unimportant
industrial economy	inexhaustible and renewable, non-renewable	open with closed elements	essential
Circular Economy (perspective concept)	inexhaustible and renewable, non-renewable	closed	unimportant

The data presented in Table 1 indicate the dependence of anthropogenic impact on the natural environment on the specifics of various economic models.

In the pre-industrial economy, the degree of anthropogenic impact on the environment was insignificant due to the use of renewable resources, despite the openness of the resource cycle and the lack of regular waste disposal and land recreation practices.

In the conditions of industrial economy, anthropogenic impact on the environment has reached a level capable of causing undesirable significant changes in the natural environment of the planet. The reason for this is the use of an open resource cycle with a significant increase in the share of non-renewable resources compared to the pre-industrial economy and the insufficiency of targeted measures to prevent and neutralize the negative consequences of this phenomenon.

III. Results

The introduction of the circular economy model is often considered today as a promising path to sustainable development. Ideally, the concept of a circular economy involves the involvement of natural resources in the economic resource cycle in a volume sufficient to ensure growth in the scale and environmental neutrality of economic activity by increasing the rationality of resource use, creating closed resource cycles in the areas of production and consumption, and creating a waste disposal industry.

The totality of planetary resource cycles in the aspect of the formation of anthropogenic impact can be presented in the form of a closed hierarchical system, the structural elements of which are resource cycles of specific environments of certain spheres of human activity.

Taking into account the structural identity of the hierarchical system of resource cycles of all types of economies, it can be argued that qualitatively different consequences of anthropogenic impact on the natural environment are determined by the parametric consistency of resource cycles in certain areas of anthropogenic activity. The formation of the global resource cycle under the influence of anthropogenic activity occurs in sequence according to the principle "from the particular to the general", which allows us to methodically correctly consider the results of any type of anthropogenic activity as factors in the formation of parameters of the natural environment.

Thus, the creation of an ecologically neutral economy model requires structural changes in certain resource cycles, increasing the rationality and efficiency of resource use, which will also lead to a change in the defining features of the economic model.

In terms of the formation of an ecologically neutral economy, it is important that different types of economic activity have different impacts on the environment. In this regard, the problem of determining the types of economic activity, the provision of targeted development of which will determine the most significant results in achieving the signs of ecological neutrality of the economy, arises.

On a global scale, the greatest negative impact on the environment is exerted by types of economic activity that have acquired high rates of development in the conditions of an industrial economy, namely energy, metallurgy, transport, etc., which are currently the main sources of anthropogenic emissions of carbon dioxide, that is, greenhouse gas, the increase in the content of which in the atmosphere is one of the significant factors in the acceleration of the rate of global warming.

It should be separately determined that the difference in the economic development of world regions, and consequently, of certain countries, also determines differences in the volumes of social production and consumption, rationality and efficiency of resource use, anthropogenic impact, which should be taken into account when determining the directions of development of the circular economy in a particular country.

The rapid growth of the scale of economic efficiency occurred in the industrial era and was determined during the first industrial revolution as a result of the growth in the use of mineral fuels due to the development of industrial methods for converting them into energy. This resulted in the creation of industrial-type energy as a separate type of economic activity. At the same time, this phenomenon not only does not reduce the importance of the fuel and energy, metallurgy, transport and logistics sectors in the modern economy, but also contributes to the development of these types of economic activity. However, these same industries are also the main sources of anthropogenic greenhouse gas emissions, since most of the primary energy consumed by these sectors consists of various types of organic fuel, the by-product of the combustion of which is carbon dioxide.

The magnitude of anthropogenic impact on the environment is closely related to the level of consumption of primary fuel and energy resources (primary energy), but the relationship of the trends of these characteristics with the scale of the economy does not demonstrate a clearly expressed general pattern of change in trends in certain regions of the world, as evidenced by the

results of studies [6]. The data indicate a weakening of the correlation between the trends in the growth rates of the global economy and the use of primary energy and the anthropogenic impact on the environment. The outpacing growth rates of global GDP over the growth rates of primary energy use and anthropogenic impact on the environment determines the trend of increasing energy efficiency of the economy against the background of an increase in the absolute value of primary energy use.

The energy efficiency of the economy and the degree of its impact on the environment largely depend not only on the total volume of primary energy use, but also on its specific structure. The results of studies [6] show significant differences in the structure of primary energy use in the world and determine the need to consider the specifics of each region separately.

IV. Discussion

The main sources of anthropogenic carbon dioxide emissions are the processes of energy conversion of organic fuels used in almost all types of economic activity. The share of organic fuel in the global volume of used primary energy in 2020 was 82.2%, of which 26.8% was solid (carbon) fuel, and 55.4% was hydrocarbon. Analysis of the chemical composition of the feedstock and energy conversion products shows that combustible substances are chemical elements - carbon (C), hydrogen (H), as well as hydrogen (H2) and incompletely oxidized compounds - carbon monoxide (CO) in the composition of the products of primary conversion of solid fuels (artificial gases). The different chemical composition of certain types of organic fuel during their combustion also determines the composition of greenhouse gas emissions. Thus, when coal is burned, mainly carbon dioxide is formed, and when hydrocarbons are burned, carbon dioxide and less physically stable water vapor are formed, and this determines the possibility of reducing anthropogenic emissions of carbon dioxide through the use of organic fuels with a high hydrogen content, that is, hydrocarbons and artificial gases.

Considering the wide raw material and technological variability of the modern sphere of energy conversion of organic fuels, it can be argued that the targeted development of a circular economy should ensure structural technological changes in the most energy-intensive types of economic activity.

In accordance with the conceptual provisions and taking into account the conditions and limitations defined above, the development of a circular economy should occur in conditions of satisfying the growing needs of society, a relative reduction in the volume of use of economic resources and an absolute reduction in the anthropogenic load on the environment.

Modern national economies of the world can be considered as a set of types of economic activity that were mastered as a certain country developed economically. In this regard, different types of economic activity in terms of composition and degree of manifestation of defining features have different levels of compliance with the conceptual features of the circular economy.

A large number of studies have been devoted to identifying the factors hindering the development of a circular economy [1-3; 7, etc.], the systematization of which allows us to identify the main groups of such obstacles: socio-cultural; legislative; poor awareness of consumers and producers about the principles and best practices of implementing a circular economy; economic; technological.

Taking into account the above, the following should be identified as promising areas for the development of the circular economy:

– preservation of circular characteristics by types of economic activity with a high degree of compliance with the requirements of the circular economy;

– formation of circular characteristics by types of economic activity with a high degree of non-compliance with the requirements of the circular economy.

In the sphere of energy use, the compliance of the value of circular characteristics of types of economic activity with conceptual requirements can be assessed on the basis of the following criteria: significance in the total volume of use of mineral organic fuel; efficiency of use of mineral organic fuel; degree of anthropogenic impact on the environment.

It is advisable to carry out a weighted assessment of the circular characteristics of certain types of economic activity on the basis of a system of indicators reflecting the criterion dependencies of these characteristics, namely, indices of economic efficiency of resource use and anthropogenic impact:

– level 1 – includes types of economic activity with a high index of economic efficiency of resource use and a low index of environmental impact. An increase in the share of these types of economic activity in the structure of the national economy causes an acceleration of the growth of circular features in it, which indicates a significant potential for accelerating the development of the circular economy according to this factor.

– level 2 – includes types of economic activity with low indices of economic efficiency of resource use and impact on the environment.

– level 3 – types of economic activity with low indices of economic efficiency of resource use and high indices of environmental impact. These types of activity have the least manifestation of circular characteristics, which determines their high potential for accelerating the development of the circular economy.

– level 4 – includes one type of economic activity with high indices of economic efficiency of resource use and environmental impact – processing industry. Reducing the negative anthropogenic impact of this type of economic activity has significant potential to accelerate the development of manifestation of circular features in the circular economy.

Taking into account the above, the promising areas for the development of the circular economy can be defined as:

– advanced economic development of types of economic activity included in the first level, namely: agriculture, forestry and fisheries; wholesale and retail trade, repair of motor vehicles;

– reduction of the negative anthropogenic impact on the environment and increase in the economic efficiency of resources for types of economic activity included in the third level, namely: supply of electricity, gas, steam and air conditioning; metallurgical production;

– reduction of the negative anthropogenic impact on the environment by types of economic activity included in the fourth level, namely the processing industry;

– economic development by types of economic activity included in the second level, namely: extractive industry and quarrying; transport, warehousing, postal and courier activities; construction; catering; water supply, sewerage, waste management.

Thus, it can be stated that the domestic economy has significant potential for circular development, which can be realized through the formation of trends: accelerated growth of production, falling on types of economic activity with a high level of circular characteristics; reduction of the negative anthropogenic impact on the environment by types of economic activity, which are characterized by a high level; sustainable growth of the efficiency of resource use by accelerating their circulation and reducing standard costs in production.

CONFLICT OF INTEREST.
Authors declare that they do not have any conflict of interest.

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